Lat 39.34851 Lon -120.29297

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Subject: Mountain pine beetle-related mortality in the Donner Plantation (FPM Report # NE97-10)

To: District Ranger, Truckee Ranger District, Tahoe National Forest

Upon receipt of a Forest Pest Detection Report from Gail Lynch, Culturist, I conducted an evaluation of several pockets of mortality in the Donner plantation, Truckee Ranger District, Tahoe National Forest, on July 8, 1997. I was accompanied in the field by Karen Jones, Gail Lynch and Tina Mark from the Truckee Ranger District. The objective of the field visit was to determine the cause of the mortality and provide alternatives for bark beetle management if needed.

The Donner Plantation was planted in the mid-1960's following a wildfire. The Donner Ridge fire burned 44,000 acres of forest in 1960. Currently the landscape is a fragmented mosaic of barren areas, brushfields, plantations and young-growth stands of eastside pine and mixed conifer. The Donner plantation is predominately ponderosa pine from mostly unknown seed sources. Several species non-native to the area were also planted but very few survived. The majority of the plantation was planted on an 8 x 8' spacing and thinned to a 10 x 10' spacing in the early 1970's. Some additional thinning has been completed to a 16 x 16' spacing; however, the majority of the plantation has remained relatively untouched since the 1970's. The number of trees per acre ranges from 200-300. The plantation was analysed in the Donner Ecosystem Analysis which was completed in 1995. The desired condition for all plantation areas is to restore continuous forest cover and convert monoculture pine plantations into multi-species unevenaged mature forests.

The ponderosa pine group kills that we examined were caused by mountain pine beetle attacks over the past 3 years. Group kill sizes range from 3-15 trees. Mountain pine beetle-related mortality has been high throughout this area since the onset of the protracted dry period which began in the late 1980's. Although most mortality has been limited to lodgepole pine in frost pockets and riparian areas it has not been uncommon to find some mortality of ponderosa pine. Some thinning activities have taken place in the plantation; however, it is still considered to be overstocked for the site capacity. Overstocking is just one of several factors that are related to increases in bark beetle-related mortality.

Historically, the most significant widespread, weather-related effect on the vegetation in California has been conifer mortality associated with severe moisture stress. Conifer mortality tends to increase whenever winter precipitation is less than about 80% of normal. Trees stressed by inadequate moisture levels have their normal defense systems weakened to the point that

they are highly susceptible to attack by bark, engraver and wood-boring beetles. Bark and engraver beetle-related mortality has decreased in this area over the past 2 years as a result of normal to above normal precipitation levels. However, mortality levels above that which are considered to be acceptable, may continue to occur in overstocked stands.

Management activities that promote tree health and vigor also reduce the susceptibility to successful bark beetle attack. Thinning is perhaps the most critical silvicultural treatment available to restore forest health. Thinning from below reduces flammable fuels, and creates growing space for trees. There are several natural and regenerated stands that are currently carrying more than the sites can support. Silvicultural prescriptions designed to reduce basal area, select against off-site tree species and remove dwarf mistletoe infested trees, should result in lower levels of bark beetle-related mortality in the future. Reduced mortality would also have the effect of a reduction in the occurrence of understocked stands that would have low canopy closure. Mortality would continue to occur and fluctuate in response to the amount of available moisture, but at levels that, through time, would more closely approximate naturally occurring mortality. Thinning would result in: a decrease in the need to enter stands to conduct salvage operations; a decrease in the amount of fuel loading and a reduction in the number of hazard trees.

Snags, down woody material and nutrient cycling would occur at more natural levels. The improved growing conditions should result in reduced mortality of large diameter trees and an increase in mid-diameter trees available to grow into large diameter classes. Selecting for a some diversity of residual tree species during thinning is desired as bark beetles are fairly host-specific and diversity should guarantee that some trees will remain alive during elevated stress periods. Limiting competing vegetation will reduce the susceptibility to various insects which often cause damage to young plantation trees. Dependent upon slash treatment, there would be some level of risk of subsequent top-kill and/or whole tree mortality to residual conifers due to pine engravers that reproduce in green slash. This risk would be considered to be lower in the range of Ips pini.

Forest Pest Management prevention/suppression dollars are available on a competitive basis for prevention thinning to limit/reduce bark beetle-related mortality. Please contact me if you have any questions regarding this evaluation or need additional information regarding a prevention proposal.

Sheri Lee Smith
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NE CA Shared Service Area

Mountain Pine Beetle, Dendroctonus ponderosae

The mountain pine beetle attacks the boles of ponderosa, lodgepole, sugar and western white pines larger than about 8 inches dbh. Extensive infestations have occurred in mature lodgepole pine forests. Group killing often occurs in mature forests and young overstocked stands of ponderosa, sugar and western white pines.

Evidence of Attack

The first sign of beetle-caused mortality is generally discolored foliage. The mountain pine beetle begins attacking most pine species on the lower 15 feet of the bole. Examination of infested trees usually reveals the presence of pitch tubes. Pitch tubes on successfully infested trees are pink to dark red masses of resin mixed with boring dust. Creamy, white pitch tubes indicate that the tree was able to "pitch out" the beetle and the attack was not successful. Besides having pitch tubes, successfully infested trees will have dry boring dust in the bark crevices and around the base of the tree. Infested trees can also have boring dust, but not pitch tubes. This may be common in drought years when trees produce little pitch. Attacking beetles carry with them the spores of blue-staining fungi. As the fungi develop and spread throughout the sapwood, they interrupt the flow of water to the crown. The fungi also reduces the flow of pitch in the tree, thus aiding the beetles in overcoming the tree. The combined action of both beetles and fungi causes the tree to die and the needles to discolor.

Life Stages and Development

The beetle develops through four stages: egg, larva, pupa and adult. The life cycle of the mountain pine beetle varies considerably over its range. One generation per year is the general rule, with attacks occurring from late June through August. Two generations per year may develop in low elevation sugar pine. Females making their first attacks release aggregating pheromones. These pheromones attract males and other females until a mass attack overcomes the tree. The adults bore long vertical egg galleries and lay eggs in niches along the sides of the gallery. The hatching larvae feed in mines perpendicular to the main gallery and construct small pupal cells at the end of these mines where they pupate and transform into adults.

Conditions Affecting Outbreaks

The food supply regulates populations of the beetle. In lodgepole pine, it appears that the beetles select larger trees with think phloem, however the relationship between beetle populations and phloem thickness in other hosts has not been established. A copious pitch flow from the pines can prevent successful attack. The number of beetles, the characteristics of the tree, and the weather affect the tree's ability to produce enough resin to resist attack. Other factors affecting the abundance of the mountain pine beetle include low winter temperatures, nematodes, woodpeckers and predaceous and parasitic insects. As stand susceptibility to the beetle increases because of age, overstocking, diseases or drought, the effectiveness of natural control decreases and mortality increases.